REMARKS

Claims 15 and 16, which depends from Claim 15, are objected to on grounds that Claim 15 is alternatively dependent on canceled Claim 13. Claim 15 has been amended to correct this defect, and the Examiner is respectfully requested to withdraw the objection to Claims 15 and 16 in view of the amendment of Claim 15.

Claim 8 has been amended to include the recitation of a cleaning step which is carried out on the specialized aluminum alloy article surface prior to formation of an aluminum-oxide comprising film over the cleaned surface. This cleaning step assists in the formation of a more densely packed and uniform oxidized aluminum layer, which reduces penetration of the oxidized aluminum layer by a corrosive environment at the upper surface of the oxidized aluminum layer. Support for the amendment of Claim 8 is present in the application Specification as originally filed at Paragraph 26, at Pages 8 - 9.

Claim 28 has been amended to include the recitation of the lower end of the concentration range for mobile impurity elements present within the aluminum alloy. Support for this amendment is present in the application Specification as originally filed at Paragraph 21, present at Page 7.

Claim Rejections Under 35 USC § 102

Claims 8 - 16 are rejected under 35 USC § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103 (a) over U.S. Patent No. 5,039,388, to Miyashita et al.

Applicants respectfully contend that the Miyashita reference does not anticipate (or render obvious) applicants' invention as claimed in Claims 8 - 16. Applicants reassert their previous argument that it is impractical to produce general semiconductor processing components using an aluminum alloy having the 1.5 μm maximum particle diameter recited in the Miyashita et al. reference, and that applicants' high purity alloy is based on a particle size distribution which permits the presence of larger diameter particles in the alloy. Further,

applicants contend that with respect to the physical behavior which is observed for an aluminum alloy, a maximum particle diameter is not indicative of a particle size distribution and is distinctly different in terms of what it teaches. The Examiner mentions that the Miyashita et al. reference recites that the base material used for making the electrodes of the Miyashita et al. reference should not contain particles having a diameter exceeding 2 microns (Col. 3, lines 45 - 49). As is evident from Claim 8, applicants' aluminum alloy may contain up to 5 % of particles which range between 5 microns and 20 microns, and up to 0.2 % of the particles may range between 20 microns and 50 microns. Thus, the Miyashita et al. reference teaches away from applicants' invention as claimed in Claim 8.

It is a combination of factors which produce the corrosion-resistant article claimed by applicants. It is the limitations specified for the concentration of mobile impurity elements in the aluminum alloy itself, combined with the limitations specified for the particle size distribution of mobile impurity particulates present in the aluminum alloy, combined with the cleaning step used to prepare the aluminum alloy surface for anodization, a combination of which enables production of the final corrosion-resistant structure. The Miyashita et al. disclosure describes aluminum alloys of different composition than those of the present inventors; does not describe a particle size distribution of the kind described and claimed by the present inventors; requires a maximum particle size in the aluminum alloy which is smaller and more expensive to produce than that described by the present inventors; uses a cleaning step prior to anodization which employs a basic solution while applicants use an acidic solution; and, focuses on the use of a chromate bath for formation of the anodized layer which is not required or even discussed by the present inventors. As a result, the Miyashita et al. reference does not anticipate applicants' invention as presently claimed in Claim 8 and claims which depend therefrom, and does not lead one of skill in the art in the direction of applicants' invention.

In more detail, as the inventors discussed in their Declaration under 37 C.F.R. § 1.132, the corrosion resistance discussed in the Miyashita et al. reference is the corrosion/erosion

resistance of the anodized layer of the electrode, and not the corrosion resistance of the aluminum alloy which underlies the anodized layer. Applicants are solving a problem which pertains to protection of the aluminum alloy surface from corrosion by preventing cracking and porosity within an overlying aluminum oxide layer, so that corrosive environments cannot penetrate the aluminum oxide layer, to reach and corrode the underlying aluminum alloy. The Miyashita et al. reference is solving a problem of how to reduce the erosion rate of an overlying anodized (aluminum oxide)layer present on plasma forming electrodes, and how to reduce the particulates which are generated by the erosion of the anodized layer at the electrode surface. Due to the difference in the problem to be solved, the underlying aluminum alloy used by applicants and the method of generating the overlying aluminum oxide layer are different.

In more detail, as previously discussed, Col. 2, lines 43 - 48 and lines 60 - 66, and Col. 3, lines 7 - 18 of the Miyashita et al. reference reads as follows: "However, aluminum electrodes having a surface layer formed by anodic oxidation in a bath containing sulfuric acid which are widely used in apparatus for high frequency plasma treatment <u>suffer a heavy reduction in layer thickness</u> due to corrosion during the treatment." . . . "Our further studies have taught us that an <u>anodized layer</u> formed by employing a chromate bath is barely corroded by active fluorine, but is durable for a long period of time <u>without having any substantial reduction in thickness</u>, as opposed to the conventional layer formed by employing a sulfate bath. . . . . <u>As it does not undergo a substantial reduction in its thickness, the (anodized) layer contains few particles that would contaminate a silicon dioxide or nitride film, or hinder its satisfactory etching."</u> (Col. 3, lines 7 - 18.) It is clear that the concern in the Miyashita et al. reference is with changes in the thickness of the anodized layer and particulates which may be generated from the anodized layer corrosion/erosion. The focus is on the use of a chromate bath to produce the anodized layer on the plasma electrodes. This does not address the problem which the present inventors' invention addresses, which is corrosion of the aluminum substrate beneath the anodized layer.

Applicants' Claim 8 has been currently amended to recite a cleaning step used in the preparation of the inventor's corrosion resistant article, which cleaning step promotes a more densely packed and uniform growth of an aluminum oxide layer grown over the surface of the cleaned aluminum alloy surface. This further reduces the penetration of the oxidized aluminum layer by a corrosive environment, improving the protection of the underlying aluminum alloy surface. (Paragraph 26 in applicants' Specification) The cleaning step employs a combination of nitric acid and phosphoric acid. This is in contrast with the cleaning step recommended in the Miyashita et al. reference which recites the use of a 5 % aqueous solution of sodium hydroxide for cleaning the aluminum base metal of the electrodes prior to anodization. (Col. 4, lines 45 - 48)

In their Declaration under 37 C.F.R. § 1.132, the present inventors described the unexpected improvement in corrosion resistance of an underlying aluminum alloy protected by an anodized aluminum layer when the method of their invention is used in the fabrication of a corrosion-resistant article for use in semiconductor processing chambers. The Examiner commented in a telephone discussion that all of the comparative data had been for an underlying aluminum alloy which was 6061 aluminum alloy. Applicants' attorney mentioned that the other aluminum alloys mentioned as acceptable substrate materials in the Miyashita et al. reference, such as 1100, 3003, 5052, and 5083 aluminum alloys, all fail to meet the claim limitations for mobile impurity element concentrations which are recited in applicants' Claim 8. This failure to meet the requirements is due to concentration differences of the kind which are exhibited between 6061 aluminum alloy and applicants' specialty aluminum alloy. Therefore, one skilled in the art reading applicants' claims would not use the alloys which are recommended for use in the Miyashita et al. reference. One skilled in the art would have good reason to believe that these other aluminum alloys are likely to behave in a manner similar to the 6061 aluminum alloy if used by applicants in a comparative example. Applicants are providing the Examiner with data sheets available from the internet for 6061, 5083, 5052, 3003, and 1100 aluminum alloys.

Although these data sheets do not list the concentration for each of the mobile impurity elements discussed by applicants, they do show that the presence of mobile impurity elements which exceed the concentration specified as a limitation in applicants' Claim 8. Further, one skilled in the art would not use the 99.0 - 99.99 % pure aluminum recommended as an alternative to the alloys listed in the Miyashita et al. reference, because this material is too expensive for use in manufacturing general semiconductor manufacturing structures. The aluminum alloys recommended by applicants exhibit a maximum purity of 96.4 %, as discussed in applicants' Specification at Paragraph 21.

There is no teaching or even suggestion in the Miyashita et al. reference about what is happening to the aluminum alloy beneath the anodic oxidation layer. The test for an acceptable anodized layer is the rate at which the anodized layer is corroded/eroded away under process conditions. (Column 5, lines 8 - 20 -- Table.) The Examiner has failed to make a prima facie case of obviousness with respect to applicants' invention and certainly has not provided evidence that applicants' invention is anticipated by the disclosure in the Miyashita et al. reference.

In light of the above distinctions and the enclosed Declaration under 37 CFR § 1.132, applicants respectfully request withdrawal of the rejection of Claims 8 - 16 under 35 USC § 102(b) over Miyashita et al.

Claim Rejections Under 35 USC § 103

Claims 17, 20, 28, 31, and 32 are rejected under 35 USC § 103(a) as being unpatentable over U.S. Patent No. 6,066,392, to Hisamoto et al. ("the Hisamoto reference"), and Miyashita et al.

Claim 17 is an independent claim which pertains to a method of creating an aluminum oxide (anodized) protective film on the surface of applicants' high purity aluminum alloy (which meets particular requirements for particle size distribution and maximum concentration of

particular mobile impurities), where the anodized film is generated using a particular acid electrolyte solution and a particular current density during formation of the anodized film. Claim 20 depends directly (and indirectly) from Claim 17. Claim 28 is an independent claim which pertains to a method of creating an aluminum oxide protective film over the surface of a high purity aluminum alloy which meets particular concentration range requirements for particular mobile impurities, and employs an electrolyte solution and current density which are not discussed in either of the references cited. Claims 31 and 32 depend directly (or indirectly) from Claim 28.

Applicants respectfully contend that the combination of references cited does not render applicants' invention obvious, because the individual references do not even suggest applicants' invention, and therefore a combination of these references cannot render applicants' invention obvious. The Examiner has not met the requirements for a prima facie case of obviousness.

In particular, the Miyashita et al. reference does not anticipate or render obvious applicants' invention for the reasons discussed above with respect to Claims 8 - 16. The Hisamoto et al. reference does relate to the protection of an aluminum alloy substrate by an anodic oxidation film formed over the aluminum alloy surface. However, the focus of the Hisamoto et al. invention is on the formation of a particular, peculiar anodized layer structure (Col. 3, lines 28 - 38) which recommends the use of an aluminum alloy different from that required by applicants (Hisamoto et al. also recommends 6061, 5052, and 3003 aluminum alloys). The Hisamoto et al. reference also requires the use of a specialized annealing process over a particular temperature range followed by a hot rolling process in production of the alloy. (Col. 6, lines 45 - 65).

The kinds of aluminum alloys which are said to be acceptable in both the Miyashita et al. reference and in the Hisamoto et al. reference do not provide an acceptable starting aluminum alloy substrate for applicants' claimed invention. Both of these references teach away from applicants' invention. Anodization of aluminum alloys recommended in the cited references

does not provide the corrosion resistance which is provided when applicants' specialized high purity aluminum alloy is used as the substrate for anodization. This is further substantiated by the newly added data in applicants' Declaration Under 37 C.F.R. §1.132 (provided with Applicants' Amendment "D"), which shows surprising results in view of the teachings of the Miyashita et al. and Hisamoto et al. references.

A combination of the teachings of the Hisamoto reference with those of the Miyashita et al. reference does not teach or even suggest applicants' invention, because the starting aluminum alloy to be anodized is different, the method of cleaning the alloy surface prior to anodization is different, and because these references do not teach or suggest use of the alloy in combination with the anodization solution and applied current density used in applicants' anodization process. All of the claims rejected in view of these two references employ a starting substrate which is different from those recommended in the references and make use of a different method in the creation of the anodized layer over the substrate surface. Both of these references teach away from applicants' invention by teaching the use of a substrate which has been demonstrated to produce an anodized layer which fails under the test conditions illustrative of the performance required from components produced for applicants' end use applications.

In light of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 17, 20, 28, 31, and 32 under 35 USC § 103(a) over Hisamoto et al. and Miyashita et al.

Claims 18 - 20 and 29 - 32 are rejected under 35 USC § 103(a) as being unpatentable over Hisamoto et al. and Miyashita et al., as applied to claims above, in view of XP-002244144 ("the XP'144 reference").

Claim 18 - 20 depend directly or indirectly from Claim 17. Claims 29 - 32 depend directly or indirectly from Claim 28. The Miyashita et al. and Hisamoto et al. references alone

or in combination do not render these claims obvious for the reasons provided above with respect to the rejection of Claims 17 and 28.

This XP'144 reference provided by the Examiner is not identified as to source or date, but appears to be text taken from some general publication regarding aluminum, surface treatment of aluminum, and uses for aluminum. In applicants' previously submitted Amendments "C" and "D", applicants requested that the Examiner identify the source of the printed matter and the date on which the XP'144 reference was published. Applicants note that the Examiner has not yet provided this information. Applicants therefore refute whether this reference is applicable under 35 USC § 103(a) until the Examiner identifies the source of the printed matter and the date on which it was published.

Even if the XP'144 reference were an applicable reference, the anodization processes described in the reference are said to be applicable to a number of aluminum alloys, including 1100, 2011, 2014, 2017, 2024, 2117, 3003, 3004, 5005, 5050, 5052, 5056, 5357, 6053, 6061, 6063, 6151, and 7075, for example. It is not possible to cite the page number of the article on which these wrought alloys are listed, because there are no page numbers on the reference document. The aluminum alloy starting materials referenced above contain maximum concentrations of particular mobile elements which are harmful during the formation of the anodic protective layer and harmful during the functioning of the anodized aluminum component over the lifetime of the component.

While it might be obvious to try known anodic coating formation methods on any aluminum alloy surface, it is not obvious which coating formation method on which aluminum alloy surface will provide a satisfactory result. For this reason, "obvious to try" is not the standard for obviousness under 35 USC § 103. This is particularly true in the present instance, where the method of forming the anodic coating requires the use of a specific anodization solution composition in combination with a specific DC current density which combination is not recited in any of the art cited. "The mere need for experimentation to determine parameters

needed to make a device work is an application of the often rejected obvious-to-try standard and falls short of the statutory obviousness of 35 U.S.C. §103." (*Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988).) "An 'obvious-to-try' situation exists when a general disclosure may pique the scientist's curiosity, such that further investigation might be done as a result of the disclosure, but the disclosure itself does not contain a sufficient teaching of how to obtain the desired result or indicate that the claimed result would be obtained if certain directions were pursued." (*In re Eli Lilly & Co.*, 902 F.2d 943, 14 U.S.P.Q. 2d 1741 (Fed.Cir. 1990).) In addition, in the present instance, there is no suggestion that use of a specialized aluminum alloy substrate of the kind described and claimed by applicants will provide an improved transition from the aluminum alloy surface to the aluminum oxide layer which improves the performance of an anodized article, as claimed in Claims 17 and 28, and claims which depend therefrom.

Since none of the three references cited teaches or even suggests the use of a specialized aluminum alloy of the kind described by applicants, where the surface of that alloy is treated using a specific electrolytic oxidation process of the kind described and claimed by applicants, a combination of these three references does not direct one skilled in the art toward applicants' invention.

In view of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 18 - 20 and 29 - 32 under 35 USC § 103(a) over Hisamoto et al. and Miyashita et al., in view of XP-002244144.

Claims 24, 25, 33, and 34 are rejected under 35 USC § 103(a) as being unpatentable over Hisamoto et al. and Miyashita et al., in view of Japanese Patent Publication No. 08-311594 ("the JP'594 reference").

The deficiencies of the disclosures of the Hisamoto and Miyashita references with respect to the patentability of the presently claimed invention are discussed in detail above with respect to the rejection of Claims 17, 20, 28, 31, and 32.

Claims 24 and 25 depend directly or indirectly from Claim 17, and Claims 33 and 34 depend directly or indirectly from Claim 28. Each of Claims 24, 25, 33, and 34 recite that, prior to creating the aluminum oxide protective film on the high purity aluminum alloy surface, the aluminum alloy is heat treated to relieve stress and increase hardness, where the heat treatment is carried out at a temperature of 330°C or at a lower temperature.

The JP'594 reference is cited by the Examiner as teaching the annealing of an Al-Mg alloy at a temperature within the range of 200 - 260°C. The focus of the disclosure is on providing an aluminum-magnesium sheet which has excellent bendability and involves a first annealing process followed by cold rolling, followed by a final annealing process. The drawings pertain to the bendability of an aluminum-magnesium sheet. The tensile strength of the alloy is discussed. There is no disclosure in the abstract regarding the composition of the aluminum alloy other than a minimum concentration of magnesium which is present. There is no mention of a particle size distribution in the abstract. There is no mention of the use of a protective coating over a surface of the aluminum-magnesium alloy for protection of the alloy.

Addition of the general subject matter which is present in the abstract of the disclosure to the subject matter which is present in the Hisamoto and Miyashita et al. references will not contribute the missing teachings which would be required to render obvious applicants' invention.

Applicants contend that Claims 24, 25, 33, and 34 are patentable over the combination of the Hisamoto, Miyashita, and JP'594 references for the same reasons that Claims 17, 20, 28, 31, and 32 are patentable over the Hisamoto and Miyashita references.

In light of the above distinctions, applicants respectfully request withdrawal of the rejection of Claims 24, 25, 33, and 34 under 35 USC § 103(a) over Hisamoto et al. and Miyashita et al., in view of Japanese Patent Publication No. 08-311594.

Applicants contend that the claims as amended are in condition for allowance, and the Examiner is respectfully requested to enter the requested amendment and to pass the application to allowance.

The Examiner is invited to contact applicants' attorney with any questions or suggestions, at the telephone number provided below.

Respectfully submitted,

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